Lauded Llamas: Image Processor

# 1. Introduction

## 1.1 Purpose

Develop software that can process and analyze the images of a drop of water bouncing off a flat plane taken from a high speed camera and output resulting data into an excel spreadsheet.

## 1.2 Scope

## 1.2.1 Main Objective

The main objective of the image processing is to locate the centroid of the drop in each frame in terms of x and y coordinates and additionally calculate the velocity and acceleration of the drop in each image.

## 1.2.2 Specific Goals

* Track the location of the drop as it falls from the source ( a needle)
* Determine the edges of the drop and subsequently the centroid of the drop in x and y coordinates
* Discern where the plane is that the droplet will bounce off
* Inputting/discerning the initial position in x and y coordinates of the needle that releases the drop
* Calculate the velocity, acceleration of the drop
* Output all result into an excel table, with information about the frame number and other similar data with one excel table representing one complete set of images
* To complete the processing of a set of images in a timely manner preferably less than the time taken by current Optimus software being used (±5 minutes)
* Implement a user friendly GUI that can be used to select images and input supporting information for processing and target output

## 1.3 Overview of Document

This document will outline the specifications that are needed for the image processing project. There will be details about the systems, methods of implementation, and some details about the team that is working on the project. This document serves to provide developers and the end user a view on what the needs of the Image Processing project are.

# 2. System

**2.1 Target Environment**

Software: Operating System - Windows 7 Professional

Hardware:

Intel Core i5

8.00 GB RAM

64 bit Operating System



## 2.2. Users

Dr. Yu Guo, Dr. Jeong Ok and their research assistants

## 2.3 Functional Requirements

## 2.3.1 Issues

## 2.3.2 Functions

The main functions of the program are

* Load and process images
* Let the user define the needle and the surface
* Calculate the centroid, acceleration and velocity
* Output results to an Excel file

## 2.3.3 Major Classes

The following is a general outline of the classes to be used in the project. There may be additional classes added as the project continues.

* User Interface
* Calculations
* Output to Excel
* Image processor

## 2.4 User Interface Specifications

The user interface must be able to facilitate selection of any image on the computer. The user must also be allowed to indicate the parameters of the space to be observed (identify the needle and the surface).

## 2.5 Non-Functional Requirements

## 2.5.1 Management

See schedule on page following page

## 2.5.2 Technical

There is some code which the team will be able to reuse from a previous project written in C#. The developers feel most comfortable writing in C++ . The program will be written using Visual Studio in C++ because the team feels more comfortable and.

## 2.5.3 Performance

The program is expected to run as fast or fast than Optimus.

# 4. Risk

There are some risks that may become a factor and could possibly cause the project to fail or to underperform. The risks to this project are:

* Team members becoming overwhelmed with work from other classes in addition to the work on this project
* Understand the requirement clearly and implementing what the customer wants, especially as more requirements are added and customer is giving input
* Lack of exposure and experience with this form of image processing and the technology (high speed camera) that accompanies it

# 5. Team Management

## 5.1 Team Members

The Lauded Llamas consists of 5 team members who have diverse experience in the computing field to help contribute to the project. The team memeber are Simbarashe Musarurwa, Kistel Hazel, Danya Bynoe, Matthew Aaron, and Michael Grayson.

## 5.2 Collaboration

Current collaboration is mainly between Michael, Kistel, and Matthew on deconstructing the Puzzle project code for its implementation into the Image Processing project. This is because they have ample experience in manipulating images from the experience in graphics programming classes. Danya and Simba will enter into coding as needed but for the majority of the time will be dealing with documentation for the project and any other non-coding related tasks that need to be performed.

## 5.3 Team Structure & Communication

The team has decided to adopt a mainly laissez-faire approach to decision making in regards to the project. All members of the team have equal say but if an impasse is come to that cannot be agreed upon Simbarashe will have the final decision, thus ensuring that the project is not slowed down by decision making. Members will maintain contact by using email, text messages, and a mobile application called GroupMe that allows for group messaging all members of the team as a result will be regularly updated about the current happening in the project.

## 5.4 Software Engineering Methodology

For this project the team has decided to incorporate Agile scrum methodology of development. This will incorporate weekly scrum meetings with the client to ensure all requirements are being met because customer wishes to have input in the project. Also the team will be collaborating heavily and assisting each other in addition to having tri-weekly scrum meetings apart from the weekly scrum meeting with the client.

# 6. Glossary

Centroid – the center of mass of an object.

Optimus – the software that is currently being used for image processing.